The quantification method can be applied similarly to embodiments where the non-linearities are expressed as sinusoidal contributions to the intensity measured by detector **32**, $s'(t)$.

Other aspects, advantages, and modifications are within the scope of the following claims.

What is claimed is:

1. A method for positioning a measurement object under servo-control based on an interferometrically derived position signal indicative of a position for the measurement object, the method comprising:

generating a compensated position signal based on the interferometrically derived position signal and at least one correction term that has a sinusoidal dependence on the position of the measurement object; and

repositioning the measurement object based on the compensated position signal and a desired position for the measurement object.

2. The method of claim 1, wherein the generation of the compensated position signal includes:

determining a speed for the measurement object based on the interferometrically derived position signal, and

selecting parameters for the at least one sinusoidal correction term based on the determined speed.

3. The method of claim 1, wherein the compensated position signal is generated by subtracting the at least one sinusoidal correction term from the interferometrically derived position signal.

4. The method of claim 1, wherein the interferometrically derived position signal is the phase of an interferometric intensity signal at a heterodyne frequency.

5. The method of claim 1, wherein the interferometrically derived position signal is a heterodyne, interferometric intensity signal.

6. The method of claim 1, wherein the at least one sinusoidal correction term comprises multiple sinusoidal correction terms.

7. The method of claim 6, wherein each of the multiple sinusoidal correction terms corresponds to a cyclic error in the interferometrically derived position signal.

8. The method of claim 1, wherein the measurement object is a stage in a lithography tool.

9. The method of claim 1, wherein the measurement object is a stage in a beam writing tool.

10. An electronic processing system for use with a servo-system for positioning a measurement object, the electronic processing system comprising:

an input port configured to receive a position signal from an interferometry system indicative of a position for the measurement object;

a memory storing a representation of non-linear errors in the interferometry system;

a processor which during operation generates a compensated position signal based on the position signal from the interferometry system and the stored representation; and

an output port configured to direct the compensated position signal to a servo-controller.

11. The electronic processing system of claim 10, wherein the stored representation of non-linear errors can be expressed as a sum of multiple correction terms each having a sinusoidal dependence on the position of the measurement object.

12. The electronic processing system of claim 10, wherein the stored representation of non-linear errors is parameterized by a speed of the measurement object.

13. The electronic processing system of claim 12, wherein during operation the processor further determines an estimate for the speed of the measurement object based on the position signal from the interferometry system, and generates the compensated position signal based on the position signal from the interferometry system, the stored representation of non-linear errors, and the estimated speed.

14. A method for determining non-linear cyclic errors in a metrology system that positions a measurement object under servo-control based on an interferometrically derived position signal, the method comprising:

translating the measurement object under servo-control at a fixed speed;

identifying frequencies of any oscillations in the position of measurement object as it is translated at the fixed speed; and

determining amplitude and phase coefficients for a sinusoidal correction term at least at one of the identified frequencies which when combined with the position signal suppress the oscillations at the at least one identified frequency.

15. The method of claim 14, further comprising:

repeating the translating, identifying, and determining steps for each of multiple, additional fixed speeds; and

generating a representation of the non-linear cyclic errors based on the coefficients and identified frequencies corresponding to the oscillations at each of the fixed speeds.

16. The method of claim 14, wherein the interferometrically derived position signal is the phase of an interferometric intensity signal at a heterodyne frequency.

17. The method of claim 14, wherein the interferometrically derived position signal is a heterodyne, interferometric intensity signal.

18. The method of claim 14, wherein the sinusoidal correction term is subtracted from the position signal to suppress the oscillations.

19. The method of claim 14, wherein the sinusoidal correction term is added to the position signal to suppress the oscillations.

20. The method of claim 14, wherein the measurement object is a stage in a lithography tool.

21. The method of claim 14, wherein the measurement object is a stage in a beam writing tool.